

Categories for Housing Performance Evaluation

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Abstract: The present global trend emphasizes more on the performance of building as it not only effects the built environment and quality of construction but also affects the human being related with it. Housing is more than a mere shelter, often confused with built form of residence. It is one the basic needs of life as it provides protection and comfort as well as health and well being. The issue of quality and its assurance in the field of housing has attracted substantial consideration globally from past decade, due to the paradigm shift from supplier orientated (provider) to demand orientated (consumer). It also impacts the frameworks, guidelines and policies of any country as the focus transferred on quality assurance in the area of housing for its longevity and sustainability. This paper reviews the various Housing Performance tools popularly used worldwide. The paper tries to categories the indicators from popular Housing Performance tools. This paper shall also attempt to assess the degree of relevance of the identified categories in the popular tools used worldwide. The paper concludes with the current status of Housing Performance Evaluation tools in context of India.

Keywords: Housing, Performance Evaluation, quality of construction, built environment, longevity, sustainability

1.0 Introduction

Housing is generally concerned with the built form of residence. However, it is not just a habitation and more than a mere shelter. Housing being one the basic needs of life provides protection and comfort as well as health and well being. Among the various types of buildings, the residential building should perform especially well because occupants spend quality time inside it which affects their peace and well being. The quote by W.Churchill “We shape our homes and then our homes shape us.” mentions the importance of housing.

Current global trend emphasizes more on the performance of building as it not only effects the built environment, quality of construction but also affect the human being linked with it. The issue of quality and its assurance in the field of housing has attracted substantial consideration globally from past decade, due to this the paradigm shift from supplier orientation to demand orientation. India being the second largest populated country of the world needs 330 million households (Census of India 2011).

Housing stock in urban India is 78.48 million for 78.86 million urban households (Census of India 2011). Currently there is a requirement for 32 million units of housing, includes both urban and rural. As a visible output housing is an effective mirror of development. It is a vital sector of the national economies creating jobs and generating taxes and wages that positively influence the quality of life (National Housing Bank, 2010). Most of the efforts to meet housing demand have been directed toward improvements in

quantitative shortage of housings, but nowadays the demand for improvements in qualitative aspects of housings is growing markedly with the increase of the housing supply rate (Kurian, 2011). Owing to the varied dynamics of housing sector in India; identifying categories for Housing Performance Evaluation is inevitable which can encompass various performance outcome/output.

1.1 Methodology

This paper aims to identify the key categories of Housing Performance Evaluation from existing tools of housing evaluation towards comprehensive articulation of relevant dimensions of the performance for housing. The paper reviews existing housing evaluation tools used worldwide for studying and to identify a broader classification of the diverse categories from the reviewed tools. The paper shall also classify indicators of existing housing evaluation tools to find the relative importance of the key categories by percentage distribution. The paper is structured into three parts as follows: The first part tries to understand the building performance evaluation and to provide an inventory of the various studies carried out on the Housing performance tools. The second part compiles of the reviewing the various tools used worldwide and at national level for housing performance evaluation. The indicators from the existing tools shall be study in deep to identify the broader set of categories with the help of discussions. The overlapping of the categories from the various tools shall be integrated according to their applicability.

The Third Section of the paper comprises assessment of categorize indicators according to the degree of relevance with the analyses based on percentage distribution of indicators under the approximate categories. Flow chart of Methodology is shown in Figure 1.

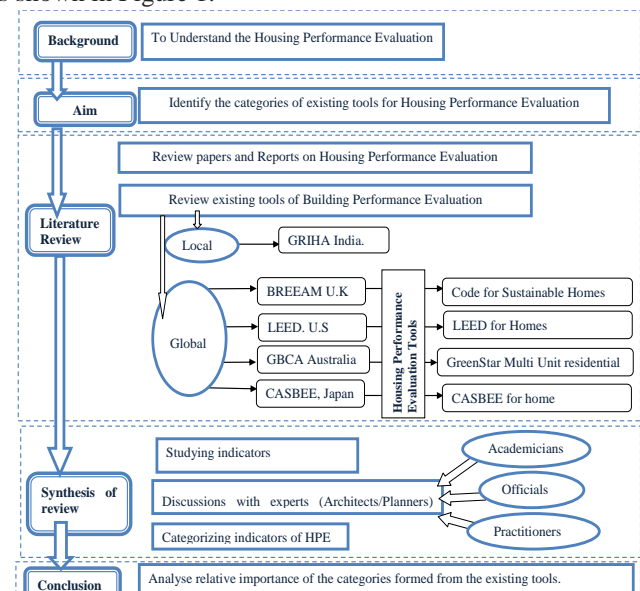


Figure 1: Flowchart of Methodology

2.0 Building Performance Evaluation

The value or performance of a product is generally reflected in its price, thinking about a building as a product, as an object of performance evaluation, it becomes clear that buildings fall somewhere in between the strict scopes of codes and guidelines (Drury 1999). The use of performance indicators emerged in the mid nineties and grew out of the new managerial tool and economic rationalist ideas that shaped public sector reform in this decade. This context gave a particular form and direction to performance indicators and in hindsight limited their capacity as useful indicators (Burke). Performance evaluation, takes place in a bottom-up direction, synthesizing the overall environmental performance of a given design starting from information on and characteristics of the technical details of the system. Development of building codes and regulations has in many countries been directed from feature based towards performance-based requirements (Drury, 1999).

In India increasing population and growth of Gross Domestic Product (GDP) has generated demand for buildings that consequent pressure to supply them encompassing various building performance features. In order to manage the pressures of increased demand several policy and regulatory mechanisms to address the urban challenges, implemented through national plans and programmes have been devised.

Since, last couple of decades several building performance evaluation tools has been developed worldwide. In the early stages of development, there has been an increasing interest in building environmental performance assessments that met the needs of the time when there was emphasis on the impact of buildings on global environment and individual health. Such assessments focused on related tools, mainly on building energy use, indoor climate, and many other environmental issues. Assessment tools have been developed with different evaluation criteria based on conditions to suit the characteristics of the countries for which the tools are designed (Abu Hassan 2011). Here Table 1 identifies some of the rating organisation engaged by various countries that address comprehensive or selective building performance in chronological order to facilitate all building types: Commercial, Institutions, and Industrial, Residential and Specialised buildings for rating or certification.

2.1 Housing Performance Evaluation

Traditionally, the evaluation of housing performance has consisted of either physical monitoring or occupancy satisfaction questionnaires, but quantitative and qualitative feedback are rarely related to each other as they span across the disciplines of building science and social science. The evaluation of user perceptions and behaviour in relation to building performance in housing is therefore an emerging research area (Stevenson, 2010). Housing performance may be complicated to evaluate but performance indicators may be helpful to measure the sustainability of new and existing housing. The Housing Performance Indicators provides the direction and guidance to the entire stakeholder ie architects, developers, agencies and occupants associated with housing for the effective and efficient development of the housing sector. The indicators might help to formulate program and

policies for better performance of housing. Furthermore, performance evaluation is also necessary to identify the demands for rebuilding as well as to serve as a fundamental measure for ensuring the longevity of buildings that offer good environment. Thus, to promote the transformation of the mainstream housing toward more sustainable practices identification of Housing Performance Evaluation indicators is need of today.

The purpose of Housing Performance Evaluation might be to actually help improve performance. This would however imply that indicator chosen would need to be ones for which the outcomes could be manipulated or altered by better program and policies. Furthermore, performance evaluation is also necessary to minimize the demands for rebuilding or remodeling as well as to serve as a fundamental measure for ensuring the longevity of buildings that offer good environment (Kim 2005). Nowadays, considering that buildings present many qualities or performances which should be taken into account for a proper evaluation (Roulet, 1999) several evaluation tools that cover building performance more comprehensively have been introduced.

Table 1: The various building evaluation organisation

Sn	Tool	Country	Year	S	Tool	Country	Year
1	BREEAM	UK	1990	16	Green Mark	Singapore	2005
2	PassivHaus	Germany	1991	17	LiderA	Portugal	2005
3	BEPAC	Canada	1993	18	NAHB	US	2005
4	Built Green Housing	US	1995	19	Sustainable Homes	UK	2006
5	HK-BEAM	Hong kong	1996	20	The Code for Sustainable Homes	UK	2006
6	HQE	France	1996	21	Green Star NZ	New Zealand	2007
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Also the performance of housing has become a matter of primary concern for homebuyers. The importance of quality housing is obvious, as also exclaimed by Kim (2005): Among the various types of buildings, the residential building should perform especially well because occupants spend quality time inside it which affects it peace and well being. Thus, the prime requirement is to identify the categories that can help to design the appropriate housing for the habitants through which housing performance can be evaluated. The rapid urbanization of India has increased the demand for housing particularly in cities along with enhancement in qualitative aspects of housings. The focus of construction activities has gradually been shifting from the quantity of housings to the quality of housings.

This paper especially focus on housing performance because it is an important feature of a building value assessment, directly related to an occupant's standard of living in his/her residential buildings. This section review the widely known evaluation tools developed by the organisations of various countries mentioned above, focus especially on housing performance. Table 2 briefs about the currently practiced Housing Performance Evaluation Tools worldwide with their categories and rating system.

Table 2: Performance Evaluation tools for Housing

Organisation	Performance Evaluation Tools	Country	Year	Evaluation Categories	Rating
BREEAM (BRE Environmental Assessment Method)	BREEAM Code for Sustainable Homes	U.K	2007	6 Mandatory categories: Energy and CO ₂ emission, Water, Materials, Surface Water Run-off, Waste, Health & Well-being. 3 flexible categories: Pollution, Management, Ecology.	Five categories: Pass, Good, Very Good, Excellent and Outstanding.
U.S. Green Building Council	LEED for Homes	U.S.	2008	eight categories: Innovative Design Process, Locations and Linkages, Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality and Awareness & Education	Certified, Silver, Gold and Platinum
Green Building Council of Australia	Green Star - Multi Unit Residential	Australia	2009	8 categories: Management, Indoor Environment Quality, Energy, Transport, Water, Materials, Land Use & Ecology, and Emissions and Innovation	1 to 6 stars
Comprehensive Assessment System for Built Environment Efficiency	CASBEE for home (detached homes)	Japan	2007	6 categories: Indoor Environment, Quality of Service, Outdoor Environment, Energy, Resources & Materials and Off-site Environment	"S (Excellent)", "A (Very Good)", "B+ (Good)", "B (Rather Good)", "C (Poor)"
Government of India and The Energy and Resources Institute New Delhi (TERI)	Green Rating for Integrated Habitat Assessment (GRIHA)*	India	2010	4 categories: Resource conservation and efficient utilization of resources, Building Planning & Construction, Building operation & Maintenance and Innovation	1 to 5 stars

*GRIHA rates all kind of buildings including housing.

3.0 Review Housing Performance Indicators

All the organization mentioned above; GBTool, BREEAM, CASBEE and LEED are the most representative environmental performance evaluation tools currently being practice worldwide. They have made significant contribution to the field of building performance assessment by providing a complete framework for evaluating housing environmental performance and meeting sustainability goals, and provide an authoritative rating for new or renovated housings.

In India, the environmental assessment tool as GRIHA has been developed already and the certification system has been in force. Its criteria are based mainly on national, and regional environmental and energy issues comprehensively. The housing performance can also be categorized on the basis of performance indicators reviewed from the tools mentioned above, for this paper the categories are selected as following steps. At first, variety of indicators from existing evaluation tools were analyzed and compared to select categories for the housing performance evaluation as it should reflect national, regional, and individual concerns if it is to be accepted and used (Todd 1999).

After reviewing tools mentioned above, 174 indicators under diverse 35 categories were identified. These Indicators were

discussed in detail among a prior identified small group comprising of experts as Academicians, Practitioner (Architects, Planners, leading Housing Builders/Developers) and Government Officer so as to classify and categorize according to the degree of relevance as shown in Figure 2.

Initially at first stage, those performance categories could be classified into 12 categories such as Building Design, Energy and Atmosphere, Water Efficiency, Sustainable Building, Building Management, Indoor Environment, Site Development, Responsive Site, Outdoor Environment, Building Planning, Materials & Resources and Health & Well-being. Further at second stage, the overlapped categories were integrated and their applicability was considered so that they can be reduced into 6 categories such as Efficient Building Design, Energy Conservation, Sustainable Building Management, Responsive Site Development, Effective Building Planning and Resource Optimization. Finally at third stage, four key categories of the indicators which have analogous performance features were concluded as:

3.1.1 Responsive Site Development: The first and foremost thing that enhances the performance of housing is its location which is responsive to the proposed development and the possible habitants. The proximity of public amenities, accessibility to the public transport and urban services adds to the performance relatively. 28 indicators under this category such as respond to and work well with the site- on & off conditions, neighbourhood context, orientation, group layout, location, surroundings, land use, etc were identified.

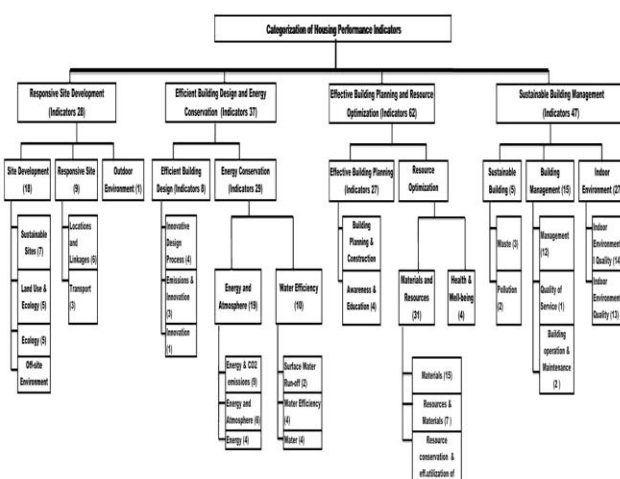
3.1.2 Effective Building Planning and Resource Optimisation: An effective planning with optimal resource utilisation is the fundamental factor for housing project to perform. Optimisation automatically links to the resource demand and planning for building effectively. Accordingly 62 indicators under this category such as safety, spatial plan, convenience with effective material, resource uses etc were identified.

3.1.3 Efficient Building Design and Energy Conservation: The efficient design of the building in context to the local condition can increase its performance remarkably and contributes toward conservation of energy and non renewable sources. 37 indicators under this category such as air ventilation, thermal Comfort, water reuse, energy efficient services and use of materials, etc were identified.

3.1.4 Sustainable Building Management: Management in the building improves the performance of the building in terms of manageability, longevity and sustainability. 47 indicators under this category such as operation and maintenance, Awareness & Education, Indoor Environmental Quality etc were identified.

4.0 Analyses of Housing Performance Evaluation Categories

Analyses of Housing Performance Evaluation Indicators were to categories which were defined by relating the characteristics of the performance indicators. The analysis of categorized indicators through percentage distribution to identify the relative importance of the key categories:



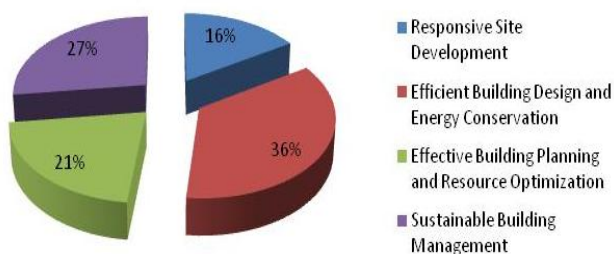


Figure 3: Pie Chart Distribution of Housing Performance Evaluation Categories

1. Maximum importance with 36% of indicators was on Efficient designing for energy conservation.
2. Second considerations with 27% of indicators were on Sustainable Building Management.
3. Later emphasized category with 21% of indicators was Effective Building Planning for Resource Optimization.
4. Least concerned category with 16 % of indicators was Responsive Site Development.

Table 3: Percentage Distribution of Categories

No. of Indicators	Percentage Distribution	Categories
28	16%	Responsive Site Development
62	36%	Effective Building Planning and Resource Optimisation
37	21%	Efficient Building Design and Energy Conservation
47	27%	Sustainable Building Management

The analysis reveals that the Housing Performance Evaluation tools are devised from developed countries and mostly representative of environmental performance assessment. Even GRIHA the evaluation tool form India also mostly focused on optimization of building design to reduce conventional energy demand and further optimize energy performance of the building within specified comfort limits. Even though the reviewed Housing Performance Evaluation tools emphasizes on planning and design (67% indicators were observed in these categories) but mostly with respect to resource optimization/ energy conservation. Only 14% indicators were identified from complete set of indicators focusing on site development and planning. Health, wellbeing and quality of life aspects were bare minimum considered.

5.0 Conclusion

The international Housing Performance Evaluation tools are developed around the premise that the buildings that have temperature control according to their climatic conditions whereas in India, a large number of buildings built to date are having these kinds of controls. Indian buildings are distinctly different in design approach than the buildings in developed countries due to diverse climatic and geographical conditions. There is a definite need to have a Housing Performance Evaluation tools tuned to Indian environmental conditions along with human well being and addressing need of the Indian building stock. The residential buildings in India

needed to be inspected for keeping the check on the building condition. As also exclaimed by technical report of National Housing Bank, 2010, Housing stock in urban India is 78.48 million for 78.86 million urban households However, the gap between household and housing stock is marginal but actual shortage is high due to a certain part of the current stock being dilapidated and people living in congested dwellings. Currently, there is no tool especially for Housing performance Evaluation is present in India.

Definitely the need of energy efficiency and environmental sustainability is the prime consideration for any developing infra structure project in today's world. However, the relevance of human health and well being cannot be ignored. The Housing Performance Evaluation Indicators along with energy efficiency and environmental sustainability should also provide the direction and basic for enhancing qualitative aspects of housings. The need of the future is compressive indicators for Housing Performance Evaluation in India context which can provide the direction and basic for the planning and development of the housing sector for ensuring the longevity of housing that offer good environment for human well being.

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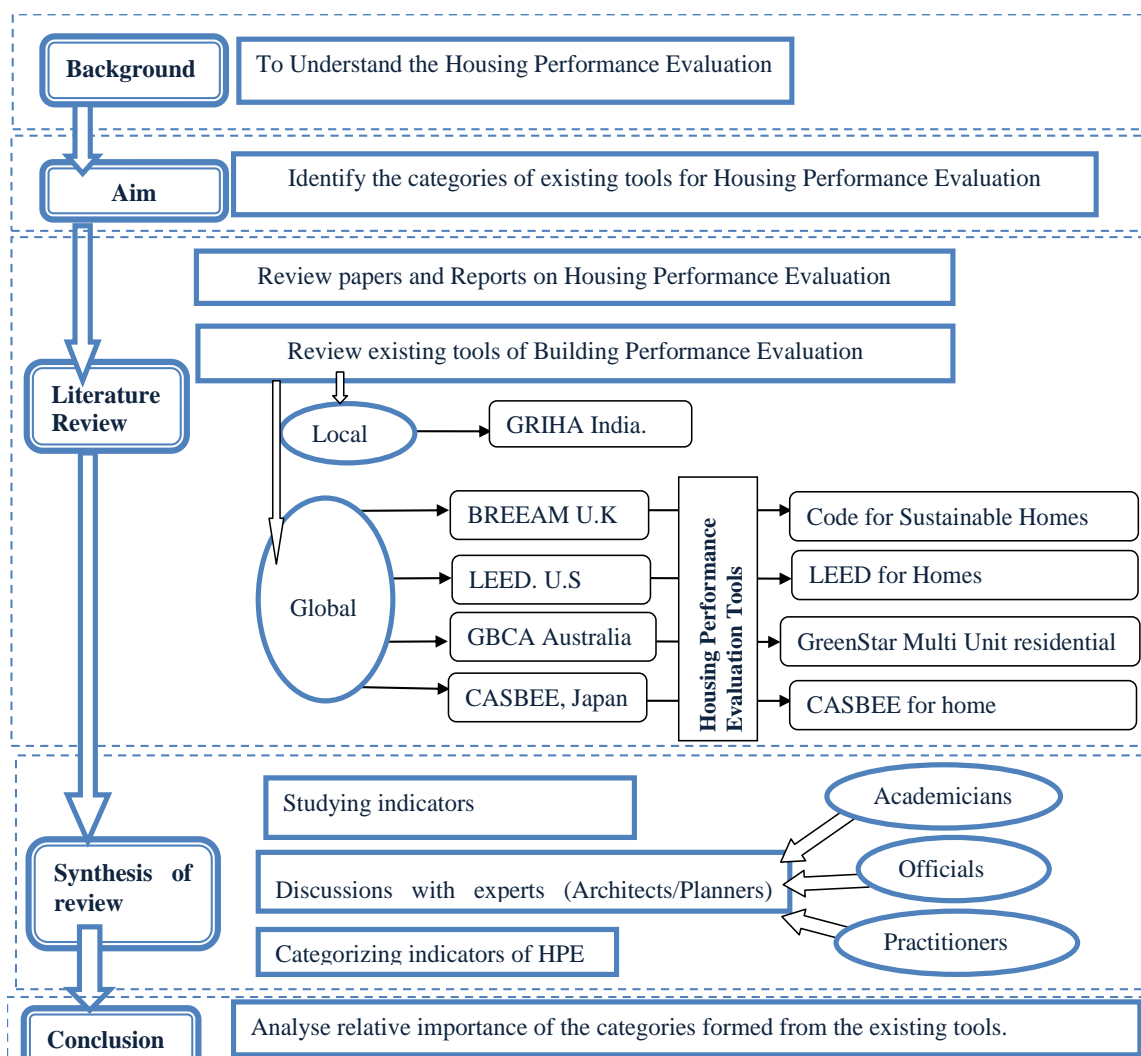


Figure 2: Flowchart of Methodology

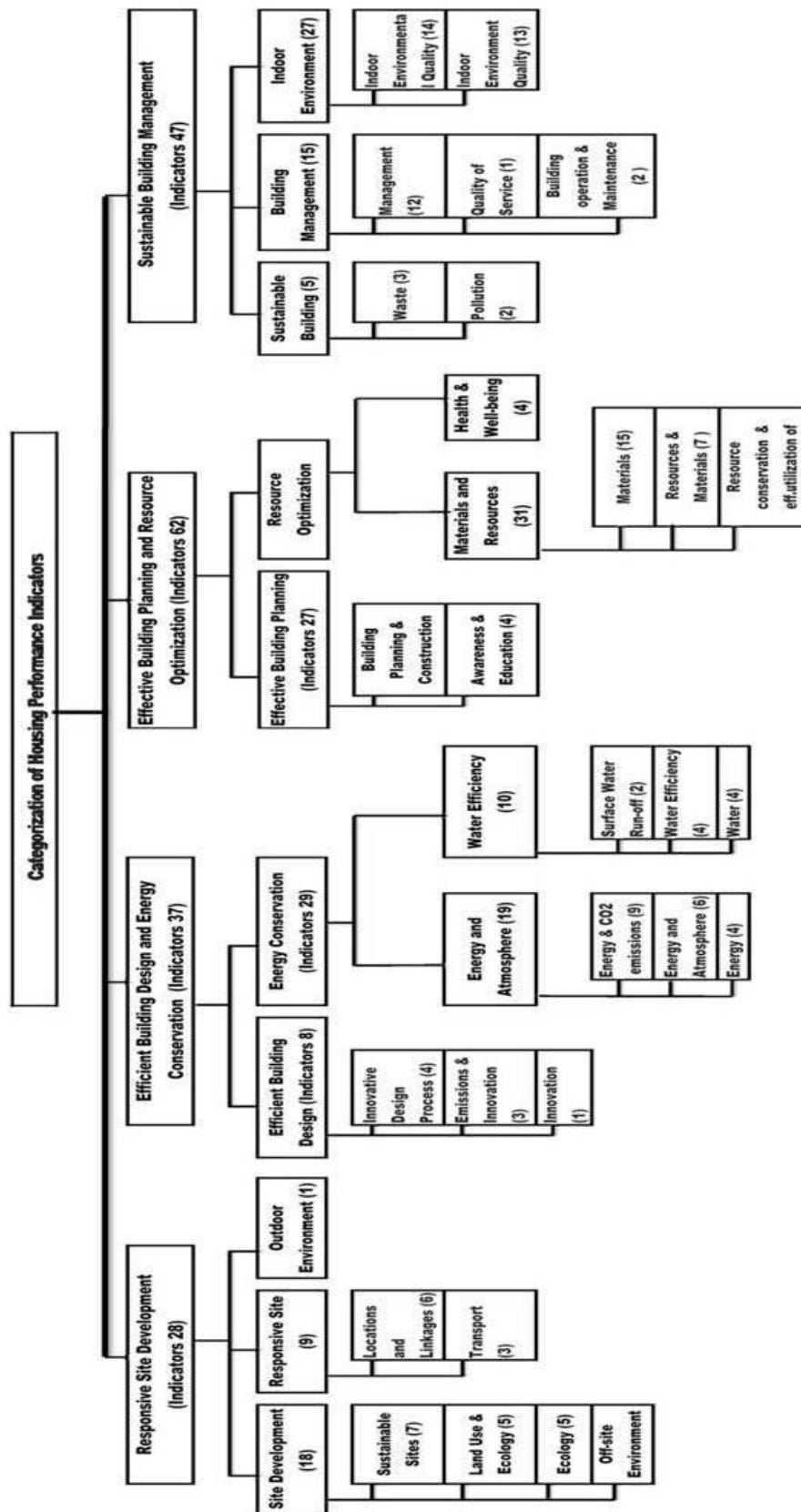


Figure 2: Categories for Housing Performance Evaluation

Table 4: The various building evaluation organisation

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Comprehensive Assessment System for Built Environment Efficiency	CASBEE for home (detached Houses)	Japan	2007	6 categories: Indoor Environment, Quality of Service, Outdoor Environment, Energy, Resources & Materials and Off-site Environment	“S (Excellent)”, “A (Very Good)”, “B+ (Good)”, “B Brown (Good)”, “B- (Rather Poor)” and “C (Poor)”
Government of India and The Energy and Resources Institute New Delhi (TERI)	Green Rating for Integrated Habitat Assessment (GRIHA)*	India	2010	4 categories: Resource conservation and efficient utilization of resources, Building Planning & Construction, Building operation & Maintenance and Innovation	1 to 5 stars